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ABSTRACT

The Preschool Preposition Test (PPT), a rapid screening test to identify delay in cognitive development of children ages 3 to 5, indicated its potential as a useful tool for the early identification of mother-child dyads in need of improving their affective relationship and verbal communications. Scores on the PPT, the Stanford-Binet Intelligence Scale, and the Peabody Picture Vocabulary Test were correlated with ratings of maternal behavior, parent-child verbal interaction, and child behavior on Bayley Test Behavior items for four samples of preschool children. Three of the samples were in home-based cognitive intervention projects; the fourth was in a preschool for physically handicapped children. Findings indicated a link between PPT scores and maternal nurturance and maternal verbal behavior with the child, factors which are often cited as related to environmentally-induced delay in cognitive development. (Author/GDC)

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AUTHORS: May Aaronson, Julie Phillips, and Darryl Bertolucci
National Institute of Mental Health, DHEW
Rockville, Maryland 20857

Doris Aaronson
New York University
New York, New York 10003

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ABSTRACT

Preschool Preposition Test Linkage with Maternal Behavior

MAY AARONSON, JULIE PHILLIPS, DARRYL BERTOLUCCI
National Institute of Mental Health, DHEW, and

DORIS AARONSON
New York University

The Preschool Preposition Test (PPT), a rapid screening test to identify delay in cognitive development of children ages 3 to 5, may prove to be a useful tool for the early identification of mother-child dyads in need of improving their affective relationship and verbal communications. Scores on the PPT, the Stanford-Binet, and the Peabody Picture Vocabulary Test were correlated with ratings of maternal behavior, parent-child verbal interaction, and child behavior on Bayley Test Behavior items for four samples of preschool children. Three of the samples were in home-based cognitive intervention projects, the fourth in a preschool for physically handicapped children. Findings indicate a link between PPT scores and maternal nurturance and maternal verbal behavior with the child, factors oft cited as related to environmentally-induced delay in cognitive development.

PPT testing materials are available on loan to researchers.

PRESCHOOL PREPOSITION TEST: LINKAGE WITH MATERNAL BEHAVIOR

May Aaronson, Julie Phillips, Darryl Bertolucci
National Institute of Mental Health, and
Doris Aaronson
New York University

The Preschool Preposition Test (Aaronson & Schaefer, 1968), a rapid cognitive screening instrument for children ages three to five, may provide a useful and inexpensive tool for the early identification of mother-child dyads in need of improving their affective relationship and verbal communications. Data collected from three samples of children in home-based intervention projects and one sample of children in special classes for the physically handicapped point to a linkage between PPT scores and maternal nurturant and verbal behavior with the child.

Previous findings (Schaefer & Aaronson, 1977) of a relationship between parent-child interactions and the child's early intellectual development have prompted the present investigation. Van Alstyne (1929) found sizeable correlations between parenting practices, such as reading to the child, and the child's vocabulary, even after partialling out the effects of the mother's intelligence. Milner (1951) reported that low scorers when compared to high scorers on school readiness tests less frequently shared mealtime conversations with their parents, experienced less affection from their parents, had fewer books, were read to less often, and had received more direct physical punishment. Bayley and Schaefer (1964) observed maternal behavior with sons during the child's first three years of life and found that ratings of Egalitarianism and Positive Evaluation of the Child were positively correlated with intelligence

test scores during the school years, while Irritability, Punitiveness, Perceives the Child as a Burden, and Ignoring were negatively correlated with the scores. Hurley (1965, 1967) also reported that measures of parental acceptance versus rejection were correlated with intelligence test scores of children.

Additionally, lack of maternal nurturance and/or of positive verbal interaction are cited as contributing to environmentally-induced delay of cognitive development in young children in reports of intervention projects designed to improve the cognitive functioning of the child (Ambron, 1977, Gordon, Guinagh & Jester, 1977; Karnes, Zehrback & Teska, 1977; Lally & Honig, 1977; Levenstein, 1977; Nimnicht, Arango & Adcock, 1977; Palmer & Siegel, 1977; Schaefer & Aaronson, 1977).

Although socioeconomic status variables tend to be correlated with parental care of young children (Bayley & Schaefer, 1960; Hindley, 1965; Milner, 1951; Pasamanick, 1959-60), Moore (1968) found that parental variables correlate with intellectual development of the child even after partialling out socioeconomic status. Contrary to generalizations reported in the literature, Schaefer and Aaronson (1977) found considerable variability in behavior characteristics related to maternal nurturance and verbal stimulation of the child among the 28 low-income families and their offspring in an early stimulation intervention program. All children living in poverty cannot be considered to be at risk for environmentally-induced delay in cognitive development. Nor can all children who are not experiencing economic deprivation be considered to have nurturant families in which there is positive verbal interaction. Yet preschool children are selected for inclusion in programs designed to facilitate intellectual development, such as the Head Start program, purely on the basis of economic disadvantage.

And within such programs, child variables which may be reflecting the nurturant and verbally responsive climate of the home may go unidentified.

Funds are too limited to provide for professional evaluations and supportive services to all children and their families; nor would it be appropriate to do so. Rather, an easy and inexpensive method of screening large numbers of children is indicated in order to identify those who may have special needs. Upon screening large numbers of children and eliminating those not in need of special consideration, it then becomes possible to concentrate scarce resources where they are needed most, for specialized evaluations and appropriate services for the relatively few.

Over the past 10 years the Preschool Preposition Test (PPT) has been used experimentally as a cognitive screening instrument for children ages three to five. A substantial amount of evidence has been accumulated demonstrating the PPT's validity and reliability with normal children and also with special populations including those with delayed language development or behavior difficulties, and older disadvantaged and mentally retarded children (Aaronson & Phillips, 1977; Aaronson, Phillips, Bertolucci & Aaronson, 1978; Aaronson & Schaefer, 1971; Aaronson & Schaefer, 1977; Schaefer & Aaronson, 1977).

The development of the PPT was based on Bayley's work on the Berkeley Growth Study data (Bayley, Note 1) with materials developed by Jaffa (Note 2). Bayley found that knowledge of prepositions correlated with verbal and spatial abilities in the early years. Later, others working with the Berkeley Growth Study data (McCall, Fichorn & Hogarty, 1977) found that knowledge of certain prepositions at 27 to 30 months correlated with IQ scores at six to 36 years of age. Earlier, Piaget (1968) had noted that verbal directions (such as those used in the PPT) generated in the child a combination of

sensorimotor activity and perceptual discrimination which may form a basis for comprehension of spatial concepts. George Miller (1976), in his review of research concerning prepositions and other spatial locatives, commented on their complexity, both cognitively and grammatically. Even adults, he said, have difficulty with some spatial words.

DESCRIPTION OF TEST

The PPT is a receptive language test which examines the comprehension of verbal directions using spatial prepositions or prepositional phrases together with nouns (objects). Each child is tested individually in as little as five minutes. Nonprofessionals can handle an entire testing program with minimal training and supervision. Because children find the game-like testing materials appealing, a high level of cooperation is typical. Rapidly gaining a young child's cooperation in a testing session, of course, is advantageous. The child has fun with the test materials. Examiners, too, enjoy working with the materials. The Examiner hands the child a halved small red rubber ball that has magnetic material sealed onto the flat side. The Examiner directs the child to make placements with the ball onto a brightly colored metal board placed upright in front of him. The board is painted with a picture illustrating a red boy facing a green car on a yellow background. The Examiner reads aloud 23 items in turn, each containing a preposition or prepositional phrase; for example, "Put the Ball <u>into</u> the boy's hands," "Put the Ball <u>in back of</u> the car." In response to the verbal direction, the child selects a location and places the magnetized red half-ball onto the board, where it adheres. On a Picture Score Sheet, which is a reduced-sized replica of the testing board-picture, the Examiner then marks the child's

placement with an "X" and an Item Number. The scoring is completed later by a Scorer who may or may not have been the Examiner. Only raw scores are used, the highest score obtainable for the 23 items being 23. Children are not tested unless English is their primary language. A more complete description of the test and testing materials is available elsewhere (Aaronson & Schaefer, 1968; Aaronson & Phillips, 1977).

SUBJECTS

The PPT has been administered to over 1800 children, ages 24 to 84 months, and to older mentally retarded children and youths. Included are children in Head Start groups, day care centers, preschools, elementary schools, home-based intervention programs, and Early and Periodic Screening, Diagnosis and Treatment Programs (Aaronson & Phillips, 1977; Aaronson, Phillips, Bertolucci & Aaronson, 1978).

Insert Table 1 about here

Reported here (Table 1) are the data collected on 103 children, ages 36 to 77 months, from black or racially mixed populations from one midwestern and two eastern cities. Three of the samples, N=75, were obtained from two home-based experimental programs in New York State and the District of Columbia that had undertaken the intellectual stimulation of children in low socioeconomic homes. The fourth sample, N=28, was obtained from an Ohio school operated by the Crippled Children's Society. The children had physical and neurological handicaps ranging from heart defects to cerebral palsy and hydrocephaly. Children in all four samples were living at home.

MEASURES

The samples in this report were selected because their ratings on the PPT were accompanied by systematic evaluations of the mother's behavior with the child in areas related to verbal interaction and nurturant behavior. All of the four samples were administered the same three measures of cognitive development: the PPT, the Peabody Picture Vocabulary Test (PPVT), and the Stanford-Binet(S-B). Additionally, measures used in the Washington, D.C. project included ratings of mother's behavior obtained on a revised version of the Maternal Behavior Research Instrument (Schaefer, Bell, & Bayley, 1959) and the Maternal Behavior with Tutor and Child Inventory (Schaefer & Aaronson, Note 5). Ratings of the child's behavior were obtained on adjective rating scales, on the Infant Behavior Inventory (Schaefer & Aaronson, Note 6), and on Bayley Test Behavior items (1969). For the two samples of children in the New York project, ratings of mothers' behavior were obtained on the Parent and Child Together (PACT, Levenstein, Note 3), on the Maternal Interactive Behavior schedule (MIB, Levenstein, Note 4), and on Bayley Test Behavior items. For the Ohio project, parent stimulation and nurturance ratings were derived from social workers' descriptive reports of home visits (Table 1).

THEORETICAL PREDICTIONS

In testing programs in which the PPT was used along with other evaluation measures, we have found evidence of a linkage between PPT scores and maternal

nurturant and cognitive stimulation of the child to be related to the child's social skills and also to his or her cognitive competence. There is an abundant body of literature describing both the negative effects of maternal deprivation and the positive effects of maternal nurturance and early stimulation upon the child's social-emotional and cognitive behavior (Aaronson, 1978; Aaronson & Rosenfeld, 1973; Bowlby, 1969; Bullard, Glasser, Heagarty & Pivchik, 1967; Schaefer, 1971; Schaefer & Aaronson, 1972; Schaefer & Bayley, 1936; Schenk-Danzinger, 1961; Stayton, Hogan & Ainsworth, 1971). This same body of knowledge recognizes the complementary nature of a child's social-emotional adaptation and his or her cognitive behavior. Piaget (1968) claims that there is a constant parallel between affective and intellectual life throughout childhood, that affectivity and intelligence cannot be disassociated, and that they constitute the two complementary aspects of all human behavior.

It seems that complex dynamics are set in motion by the early reciprocal communications which take place between parent and child. The parent-child relationship influences both the child's emotions and his or her learning behaviors. At the same time, within the child the resultant social behaviors and cognitive performance become interrelated and interdependent. If these processes exist, they should be reflected in our data in correlations between PPT Test scores and ratings of parental nurturant and verbal behavior. We find that it is so and will demonstrate the processes through a series of three correlational studies, based on the following hypotheses:

1. If maternal social-affective behavior creates an environment in which the child learns social affective behavior, then we should be able to provide empirical evidence for this theoretical relationship.

2. If, as Piaget claims, the child's affective and intellectual life constitute two complementary aspects of human behavior, we should find correlational evidence between the child's affective behaviors and his cognitive performance.

3. If the level of intellectual communication between mother and child influences the child's cognitive behavior, correlations of maternal behavior ratings with the child's cognitive test scores should reflect this influence.

The three correlational studies, taken together, should illustrate and provide empirical evidence of the dynamics involved in linking the early parent-child relationship to the child's cognitive test performance. To the extent that we employ the PPT along with the PPVT and the S-B in our studies, we are able to fulfill two objectives. The first, of course, is to demonstrate the linkage between PPT scores and maternal nurturant and verbal behavior, which is the purpose of this report. The second is to demonstrate that on the whole, the linkage is impressive with the PPT, a brief screening instrument, when compared with that of two recognized full-scale cognitive tests.

RESULTS

PPT as an Indicator of Cognitive Performance. Before we begin, however, we must briefly present evidence based on the samples we use in this report, as we have done with other samples in past reports (Aaronson & Phillips, 1977; Aaronson, Phillips, Bertolucci & Aaronson, 1978), that the PPT is indeed an acceptable indicator of cognitive performance.

Insert Table 2 about here

Presented in Table 2 are the correlations between PPT scores and the mental age scores on the PPVT and S-B, obtained from the four samples which are reported in this study. The PPT has only raw scores. Its scores are therefore more comparable to raw or mental age scores on other tests than to IQ scores which are standardized for age. The correlations of the PPT with the other two tests range from .56 to .80 ($p < .01$). The PPT correlates about as well with the other two tests as they correlate with one another (.55 to .84). Moreover, these data support previously reported PPT correlations with tests of cognitive performance. Results of PPT validity and reliability studies (Aaronson & Phillips, 1977; Aaronson, Phillips, Bertolucci & Aaronson, 1978) have established that the test is a substantial indicator of cognitive performance and can serve to considerably reduce the time and expense involved in screening large populations of preschool children. The three correlational studies follow.

Insert Table 3 about here

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1. Correlations between Maternal Behaviors and Child Affective Behaviors.

a. Maternal and Child Negative Behaviors. The expressed goal of the District of Columbia's project was intellectual stimulation of the child with an emphasis on language development. Home visitors interacted with the child, and the mother was invited but not required to participate in the tutoring sessions. Maternal behavior with the child was rated by the tutors at 16 months on the Maternal Behavior Research Instrument (Schaefer, Bell & Bayley, 1959) and at 30 and 36 months on the Maternal Behavior with Child Inventory (Schaefer & Aaronson, Note 5). Child behavior was rated at 36 months on the Infant Behavior Inventory (Schaefer & Aaronson, Note 6). Table 3 presents

correlations of ratings of maternal negative behaviors at 16, 30, and 36 months with child behaviors at 36 months (N=26-28). The most important information Table 3 provides can be seen at a glance -- that maternal hostile and punitive behaviors and low verbal expressiveness with the child have positive correlations in every instance with the child's behaviors of Hostility, Belligerence, Negativism and Irritability. The one positive child's behavior, Task-Oriented, in every instance has negative correlations with maternal negative behaviors, many correlation coefficients reaching statistical significance. Isolation of the child, expressed through maternal behaviors of Low Maternal Involvement, Low Verbal Expressiveness, and Withdrawal of Relationship tend to have the strongest positive correlations across child behaviors of Hostility and Belligerence and the strongest negative correlations with the child's Task-Oriented behavior. Almost half of the correlations of the negative maternal behaviors at 16 months, 60 percent at 30 months, and 76 percent at 36 months, reach statistical significance with the child's antisocial and low task-oriented behaviors at 36 months, an increasing effect with time. It is difficult to designate which of the maternal behaviors refer specifically to either nurturant or to verbal behaviors. Withdrawal of Relationship would indicate lack of both behaviors, as would Hostile Detachment and Low Involvement. Low Verbal Expressiveness has specificity. We can assume that the other behaviors include both nurturance and verbal communication with the child.

b. Maternal and Child Positive Behaviors. The New York State project shows a correspondence between positive maternal behaviors and prosocial child behaviors. In this project, as in the one in the District of Columbia, the program was conducted by home visitors. The ultimate objective of both projects was similar in that both strove for intellectual stimulation of the

child with an emphasis on language development. The procedures differed, however. In the New York project (N=21 to 42) the mother was required to participate in the tutoring sessions and an intermediate goal was to improve the parent-child relationship and encourage the mother to take over the education of her child. Maternal behaviors were rated by the tutors on the PACT (Parent and Child Together, Levenstein, Note 3) and by staff raters of videotapes on the MIB (Maternal Interactive Behavior, Levenstein, Note 4). Child Behaviors were rated during cognitive testing sessions on Bayley Test Behavior items by the psychological testers.

Insert Table 4 about here

Table 4 presents correlations of Maternal Behaviors with Child Behaviors at around four years of age for the two New York groups combined. The maternal behaviors are Verbal Interaction, Nurturance, Verbalizes Affection, and Stimulates Play and Fantasy. The child behaviors are Responds to Objects, Goal Directed, Attention Span, Cooperative, Endurance, and Task Oriented. The most important evidence here is that positive maternal behaviors correlate positively in every instance with prosocial child behaviors, the majority of the correlation coefficients reaching statistical significance. The child's cooperative behavior correlates most consistently across the maternal measures. The maternal behavior, Stimulates Play and Fantasy, correlates highly across child behaviors. Maternal behaviors which appear to combine both nurturance and verbal interaction, Verbalizes Affection and Stimulates Play and Fantasy, both have stronger correlations with child pro-social behaviors than do the items for Verbal Interaction and Nurturance which deal with the

same behaviors individually and separately. The data from the District of Columbia project and the New York State project complement each other, one dealing with antisocial mother-child interactive behaviors, the other with prosocial mother-child interactive behaviors.

2. Correlations between the Child's Affective Behaviors and Cognitive Performance.

In the second of our three studies the relationship between the child's affective and intellectual life is investigated by examining the interactions between ratings of the child's affective behaviors and his or her scores on cognitive tests. Positive correlations between the child's prosocial behaviors and cognitive test scores and negative correlations between the child's antisocial behaviors and cognitive test scores are to be expected. Again, use is made of the District of Columbia project data related to the child's antisocial behaviors and the New York State project's data related to prosocial behaviors to examine evidence.

Insert Table 5 about here

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a. Child Antisocial Behaviors and Cognitive Test Scores. Correlations between child behaviors as rated on the Infant Behavior Inventory (Schaefer & Aaronson, Note 6) and cognitive test scores on the PPT, PPVT, and S-B (N=28) were obtained at 36 months for the children in the District of Columbia project (Table 5). All three cognitive tests correlated negatively with the child's behaviors of Hostility, Belligerence, Negativism, and Irritability; that is, there is an inverse relationship between these behaviors and performance on cognitive tests. With all three tests in every instance the relationship between hostile behaviors and poor test scores is demonstrated. The Stanford-

Binet demonstrates the relationship best, with test correlations with all four behaviors reaching statistical significance; the PPT follows with two statistically significant correlations; the PPVT correlations do not reach significance. Although the S-B has the highest correlations linking the child's affective behavior to his cognitive functioning in this set of data, the PPT is not too far behind.

Insert Table 6 about here

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b. Child Prosocial Behaviors and Cognitive Test Scores. For the New York project, two samples combined (N=21 to 44), ratings of the child's prosocial behaviors on the Bayley Test Behavior items were correlated with cognitive test scores on the PPT, PPVT and S-B (Table 6). All three cognitive tests correlated positively with the child's behaviors of Responds to Objects, Goal Directed, Attention Span, Cooperative, Endurance, and Task Oriented, almost 90 percent of the correlations reaching statistical significance. Again the S-B leads the other tests in ability to demonstrate the relationship, in this case, between the child's positive affective behavior during the testing session and the test scores. However, all three of the cognitive tests would be satisfactory indicators of the relationship between affective behavior and cognitive performance for the child. The data in the District of Columbia project have many correlations in the .40s, .50s, and .60s which demonstrate the interrelatedness of child hostility and poor cognitive test scores, while the New York project very clearly demonstrates that prosocial behavior and positive cognitive test performance go hand in hand. In the latter project a number of the correlations reach into the .70s and .80s.

3. PPT Linkage with Maternal Behavior Ratings

We have provided evidence that ratings of maternal behaviors correlate significantly with those of the child's affective behaviors, and that ratings of the child's affective behaviors and cognitive performance correlate significantly. Also it has been shown that PPT scores correlate significantly with scores on recognized cognitive tests, and correlate in the appropriate direction with antisocial and prosocial behaviors in the child. In this, our third correlational study, we now address our third hypothesis which is concerned with the relationship between maternal behaviors and the child's cognitive performance. In addition to providing evidence of the mother-child interrelatedness in this respect, we must also demonstrate that the PPT score is a sufficient indicator of the child's cognitive performance to provide evidence of the linkage between the child's cognitive performance and maternal behavior ratings. In pursuit of this objective, we will again examine data from the District of Columbia and New York projects and we will add data from the Ohio program for physically handicapped children.

Insert Table 7 about here

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a. Negative Maternal Behaviors and Cognitive Scores. For the District of Columbia sample (N=28) we have correlated negative maternal behavior ratings obtained at 16, 30 and 36 months with scores on the PPT, PPVT and S-B tests administered to their children at 36 months (Table 7). For the PPT and the S-B in every instance and for the PPVT, in the majority of the correlations, there are negative correlations between maternal negative behaviors and the child's cognitive test scores, or an inverse relationship between the two.

Negative maternal behaviors and the child's poor cognitive test behavior are consistently related. This relationship reaches a statistical significance with PPT scores in 13 out of 15 instances, or almost 90 percent of the time, with the S-B scores eight out of 15 instances, or little more than half the time. The more hostile the mother's behavior the poorer the child's cognitive scores. The maternal behaviors with the strongest negative correlations with cognitive test scores are related to Low Verbal Expressiveness, Punitiveness, and Withdrawal of Relationship. Placing the child in relative isolation by withdrawing from the relationship and rarely communicating with him over a two-year period of time appear to have the strongest influence on child cognitive test scores. The District of Columbia data not only illustrate and provide evidence for a linkage between negative maternal behavior and the child's poor cognitive performance, but the linkage is well established on the basis of the PPT scores.

Insert Table 8 about here

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b. Positive Maternal Behaviors and Cognitive Scores. Having demonstrated a statistically significant link between corelations of maternal hostile behavior and low verbal expressiveness with the child and the child's poor cognitive test performance, we are ready to inspect correlational data for the New York project (N-42, age 4, two groups combined) for the effect of positive maternal behaviors on the child's cognitive test performance. Table 8 presents maternal behaviors Verbal Interaction, Nurturance, and Verbalizes Affection correlated with the PPT, the PPVT, and the S-B. Again the most important effect is that all the test correlations with positive maternal behavior are in the same direction -- positive. The linkage of the

child's cognitive test scores with the positive maternal behaviors is not as strong as the negative linkage in the District of Columbia project, but nevertheless seven of nine correlations, or almost 80 percent, reached statistical significance. With the New York data, correlations between maternal nurturant and verbal behaviors and the child's test scores are somewhat better for the PPVT than the other two tests and better for the S-B than the PPT. However, the differences are not great, none of the three tests performing poorly in this respect.

Insert Table 9 about here

For the Ohio sample of physically handicapped children (N=28), ages approximately three to six years, in special classes for the physically handicapped but living at home, we do not have separate ratings for maternal nurturant and verbal behavior with the child. Instead we have one combined rating based on social workers' descriptive reports of "maternal nurturance" plus "creating a stimulating environment" for the child (Table 9). When this rating was correlated with test scores on the PPT, PPVT and the S-B, the respective correlations were .46, .58 and .50. Again the PPVT score is somewhat better than the other two, the S-B is better than that of the PPT, but the differences among them are not great, not any of the three tests performing poorly in this sample.

The data presented here for the Washington, D.C., the New York, and the Ohio samples amply demonstrate a firm and consistent linkage between PPT scores and maternal behavior ratings related to nurturance and verbal interaction with the child. When comparing correlations between PPT, PPVT, and

S-B scores and maternal nurturance and verbal behavior, the PPT clearly excelled in the Washington data, which was longitudinal in nature, and maintained relatively consistent correlations in the other two samples, as did the S-B but not the PPVT. We must call attention to the fact that I.Q. scores were used for the latter two tests, and that the PPT could fare even better in comparison to the other cognitive tests if all three tests were compared by raw scores.

SUMMARY AND CONCLUSIONS

The prevention of mental retardation and related developmental disabilities is the ultimate goal of our national effort to combat these handicaps. Significant progress toward this objective is shown by advances made in improved and expanded service programs, such as EPSDT* (Rojcewicz & Aaronson, 1976), Head Start, Home Start, Follow-Through, and Right-to-Read. For the most part, programs of this nature are serving children for whom early life experiences are sufficiently limiting to incur risk of delayed development. If, as believed, early intervention is important in preventing delayed development in high risk children, provision must be made for early identification and the timely entry of the children into their community's service delivery system (Tjossem, 1976).

In this report we are concerned with only one aspect of the greater problem, the technical problem of screening to identify those preschool children, ages three to five, at risk of delay in cognitive development. Only limited progress has been made in developing cognitive screening instruments acceptable to diverse cultural groups that can be administered quickly and inexpensively by non-professional personnel upon brief training (Zeaman, 1975).

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*EPSDT - Early and Periodic Screening, Diagnosis and Treatment Program, a Medicaid program for childrn eligible for welfare.

The Preschool Preposition Test qualifies as a screening tool that could be used expeditiously and economically to rule out those children who do not need early special services and to identify those that do. A substantial amount of evidence has been accumulated over the past 10 years and reported elsewhere (Aaronson & Phillips, 1977; Aaronson, Phillips, Bertolucci & Aaronson, 1978) concerning the validity and reliability of the scores on the PPT in general child populations and also with special populations including those with delayed language development, physical and neurological handicaps, behavioral difficulties, and other problems (It Works, 1969; O'Connell, Terrill & Brash-Sorensen, 1974; Schaefer & Aaronson, 1977).

This report has a primary goal of presenting evidence of a linkage between the PPT scores and maternal nurturant and verbal behavior with the child. However, it also attests to the power of the parent-child relationship to influence the child's behavior in both the affective and cognitive realms. Let us review briefly the data which have been presented. We began by establishing on the basis of our present data (as we have done in other reports with other data) that the PPT is indeed an acceptable indicator of cognitive performance, correlating strongly and consistently across samples with the more sophisticated and time-consuming cognitive tests which were used with it in testing programs in four separate samples of children in three different projects. Additionally, the PPT correlated as well with the other tests of cognitive ability as they did with one another. At the same time, the PPT has advantages over the others in that it can be administered rapidly and economically to large populations by nonprofessional personnel.

To present evidence of a PPT linkage with maternal behavior in a meaningful way, consideration was given to findings that mother's nurturant and

cognitive stimulation of the child is related both to the child's affective behaviors and to his or her cognitive competence. By using the PPT along with the PPVT and S-B throughout our studies, we were able to demonstrate linkages between PPT scores and maternal nurturant and verbal behavior, and, at the same time, compare these results with those on the other two tests.

With data obtained from the experimental group of a home-based early child stimulation program in the District of Columbia, we were able to demonstrate statistically significant correlations between maternal hostility and low verbal expressiveness and the child's hostile, belligerent and low-task-oriented behavior. In a complementary way, a New York project demonstrated a relationship between positive maternal and child behaviors.

We next examined the interrelatedness of the child's affective and cognitive behaviors. In the District of Columbia project statistically significant correlations were found between the child's negative affective behaviors and his or her cognitive performance on the PPT and other cognitive tests. Data from the New York project demonstrated that the reverse could also be shown, i.e., significant correlations between the child's positive affective behaviors and his or her test performance. Thus the data provide evidence that affective behaviors and cognitive performance were interacting with each other.

Finally, evidence is presented from all four groups, the District of Columbia, two New York State projects, and the Ohio project for physically handicapped children, that the PPT consistently, across samples and over time, has statistically significant correlations with both positive and negative maternal behaviors related to nurturance and verbal interaction with the child.

Having presented evidence that the PPT is an acceptable indicator of cognitive performance for children ages three to five, and that there is a linkage between PPT scores and ratings of maternal nurturant and verbal behavior with the child, we would like to close on a note of caution. No claim is made that the PPT is more than a cognitive screening test. Children who earn low scores on the PPT need further evaluation to corroborate the cognitive implications and to attempt to discover the contributing causes. Lack of maternal nurturance and verbal interaction with the child may or may not be a contributing cause in a particular case. However, as a possibility, it should be investigated along with other possible causes, in order to develop appropriate prescriptive assistance to the child.

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TABLE 1
DESCRIPTION OF PRESCHOOL PREPOSITION TEST SAMPLES WITH MATERNAL BEHAVIOR DATA

Location of Sample	N	Sex	Race: Black White	Socio-Economic Status	Age Range at PPT Testing	Measures
District of Columbia (Urban)	28	M	B	Low	36	PPT, PPVT, S-B, Mother Ratings, Child Ratings
New York State (Urban) 1973 Sample	26	M&F	B&W	Low	40-54	PPT, PPVT, S-B, Bayley Test Behavior, Mother Ratings
New York State (Urban) 1975 Sample	21	M&F	B&W	Low	42-53	PPT, PPVT, S-B, Bayley Test Behavior, Mother Ratings
Ohio (Urban & Suburban)*	28	M&F	B&W	Mixed	41-77	PPT, PPVT, S-B, Ratings of Maternal Nurturance and Stimulation Combined
Total Subjects	103					

*Physically Handicapped Sample

PPT - Preschool Preposition Test
PPVT - Peabody Picture Vocabulary Test
S-B - Stanford-Binet

TABLE 2
CORRELATIONS OF PRESCHOOL PREPOSITION TEST RAW SCORES WITH
PEABODY PICTURE VOCABULARY TEST AND STANFORD-BINET MENTAL AGES

Sample	N	PPT Raw/ PPVT M.A.	PPT Raw/ S-B M.A.	PPVT/S-B M.A.
District of Columbia	29	.61	.60	.55
New York State, 1973	23	.56	.80	.67
New York State, 1975	21	.75	.69	.84
Ohio	28	.74	.73	.76

All correlation values $p < .01$ (two-tailed test)

Note: PPT has only raw scores. Mental Ages provide a more meaningful comparison with raw scores than do IQs.

TABLE 3
CORRELATIONS OF PARENT BEHAVIOR AT 3 AGES WITH CHILD BEHAVIOR AT 36 MONTHS
DISTRICT OF COLUMBIA SAMPLE, N=26 to 28

	Maternal Behavior, 16 Mos.					Maternal Behavior, 30 Mos.					Maternal Behavior, 36 Mos.				
Child Behavior	Withdrawal of Relationship	Punishment	Use of Fear to Control	Irritability	Punitiveness	Hostile Involvement	Hostile Detachment	Low Interest in Child's Education	Low Verbal Expressiveness	Low Involvement	Hostile Involvement	Hostile Detachment	Low Interest in Child's Education	Low Verbal Expressiveness	Low Involvement
Hostility	.43	.39	.33	.21	.34	.39	.40	.47	.45	.73**	.40	.57**	.60**	.54**	.68**
Belligerence	.56**	.51*	.45	.47	.35	.41	.35	.45	.47	.47	.56**	.51*	.45	.42	.35
Negativism	.22	.47	.42	.30	.31	.46	.21	.21	.26	.43	.22	.47	.42	.30	.31
Irritability	.47	.48*	.39	.35	.36	.41	.20	.36	.29	.49*	.47	.48*	.39	.35	.36
Task-Oriented	-.36	-.43	-.36	-.25	-.32	-.37	-.35	-.33	-.45	-.52*	-.39	-.49*	-.45	-.54**	-.45

For underlined values $p < .05$
*$p < .01$
**$p < .005$

TABLE 4
CORRELATIONS OF MATERNAL BEHAVIORS WITH CHILD BEHAVIORS
TWO NEW YORK STATE SAMPLES COMBINED

		Maternal Behaviors			
Child Behavior[1]	N	Verbal Interaction (PACT)[2]	Nurturance (PACT)	Verbalizes Affection (PACT)	Stimulates Play and Fantasy (MIB)[3]
Responds to Objects	21	.15	.12	.25	.24
Goal Directed	42	.41**	.33*	.51**	.24
Attention Span	21	.47*	.28	.45**	.50
Cooperative	42	.34*	.34*	.40	.55*
Endurance	42	.16	.37*	.41**	.24
Task Oriented Score (Sum of Bayley Items)	21	.40	.24	.33	.60*

For underlined values $p < .10$
$*p < .05$
$**p < .01$ (two-tailed test)

[1]Bayley Test Behavior Items
[2]PACT - Levenstein's Parent and Child Together ratings
[3]MIB - Levenstein's Maternal Interactive Behavior ratings

TABLE 5
CORRELATIONS OF CHILD'S BEHAVIOR WITH COGNITIVE TEST SCORES
FOR DISTRICT OF COLUMBIA SAMPLE N=28

Child Behavior 36 Months	Preschool Preposition Test	Peabody Picture Vocabulary Test IQ	Stanford-Binet IQ
Hostility	-.53*	-.28	-.57*
Belligerence	-.46	-.30	-.64*
Negativism	-.27	-.37	-.54*
Irritability	-.32	-.16	-.42

For underlined values $p < .05$
$*p < .005$
(Two-tailed test)

TABLE 6
CORRELATIONS OF CHILD'S BEHAVIORS IN TESTING SESSION
WITH COGNITIVE TEST SCORES
TWO NEW YORK STATE SAMPLES COMBINED

Behavior Items (From Bayley Infant Behavior Record)	N	PPT	PPVT IQ	S-B IQ
Responds to Objects	21	.45	.69*	.74*
Goal Directed	44	.51*	.51*	.77*
Attention Span	21	.67*	.68*	.77*
Cooperative	44	.39*	.37	.48*
Endurance	44	.02	.08	.67*
Task Oriented Score (Sum of Bayley Items)	21	.59*	.79*	.80*

For underlined values $p < .05$
*$p < .01$ (two-tailed test)

PPT - Preschool Preposition Test
PPVT - Peabody Picture Vocabulary Test
S-B - Stanford-Binet Test

TABLE 7
CORRELATIONS BETWEEN MATERNAL BEHAVIORS AT THREE AGES AND CHILD'S COGNITIVE TEST SCORES AT 36 MONTHS
DISTRICT OF COLUMBIA SAMPLE, N=28

Maternal Behavior at 16 Months	PPT	PPVT IQ	S-B IQ
Punitiveness	-.60**	-.12	-.27
Withdrawal of Relationship	-.55**	.13	-.40
Use of Fear to Control	-.50*	.02	-.38
Punishment	-.47	.08	-.40
Irritability	-.46	.04	-.26
Maternal Behavior at 30 Months			
Low Verbal Expressiveness	-.60**	-.36	-.42
Low Involvement	-.49*	-.11	-.41
Hostile Detachment	-.46	-.24	-.31
Low Interest in Child's Education	-.46	-.11	-.27
Hostile Involvement	-.38	-.12	-.34
Maternal Behavior at 36 Months			
Low Verbal Expressiveness	-.53**	-.21	-.48*
Hostile Involvement	-.41	-.03	-.35
Hostile Detachment	-.40	-.01	-.45
Low Involvement	-.36	.16	-.27
Low Interest in Child's Education	-.30	.09	-.40

For underlined values $p < .05$
$*p < .01$
$**p < .005$ (two-tailed test)

PPT - Preschool Preposition Test
PPVT - Peabody Picture Vocabulary Test
S-B - Stanford-Binet Test

TABLE 8
CORRELATIONS BETWEEN MATERNAL BEHAVIORS AND CHILD'S COGNITIVE TEST SCORES
TWO NEW YORK STATE SAMPLES COMBINED, N=42

Maternal Behavior (from PACT)[1]	Preschool Preposition Test	Peabody Picture Vocabulary Test IQ	Stanford-Binet IQ
Verbal Interaction	.41*	.48*	.37
Nurturance	.24	.40*	.34
Verbalizes Affection	.36	.33	.40*

For underlined values $p < .05$
*$p < .01$ (two-tailed test)

[1]PACT - Levenstein's Parent and Child Together ratings.

TABLE 9
CORRELATIONS BETWEEN MATERNAL BEHAVIOR AND CHILD'S COGNITIVE TEST SCORES
OHIO SAMPLE OF PHYSICALLY HANDICAPPED CHILDREN N=28

	Preschool Preposition Test	Peabody Picture Vocabulary Test IQ	Stanford-Binet IQ
Maternal Nurturance and Stimulation Combined	.46	.58*	.50*

For underlined values $p < .02$
*$p < .01$